

Tobacco growing in Minnesota

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TOBACCO SPEAR USED IN STRINGING THE PLANTS ON A TOBACCO LATH

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The first tobacco grown in Minnesota for commercial purposes was grown in Sherburne County in 1909. For several years a field assistant was employed, through a state appropriation, to aid in teaching farmers correct methods of growing and handling the crop. C. H. Lien, one of the writers of this bulletin, was employed at various times in this capacity.

Tobacco growing is a specialized industry and, as a special curing shed and other equipment are required, it should not be undertaken by farmers who have not had previous experience in handling the crop unless the necessary information is obtained regarding the undertaking.

From 1909 to 1932 there was a gradual increase in the amount of tobacco grown in Minnesota and, in general, a fair profit has been obtained by the grower when careful attention has been given to correct methods of handling the crop. The season of 1932 was not particularly favorable, and even growers who obtained a fair crop received very low prices. This has resulted in a great reduction in acreage, the number of acres planted to tobacco in 1932 being less than half that planted in 1931.

Table 1
Tobacco Production in the United States*

State	Production				1930 average yield per acre	1930 price per lb.
	Av. 1925-30		1930			
	000 pounds	Per cent	000 pounds	Per cent		
					lb.	cents
North Carolina	490,946	33.5	585,990	35.8	765	12.9
Kentucky	335,723	23.9	372,123	22.8	717	12.2
Virginia	121,932	8.7	112,530	6.9	605	8.8
Tennessee	98,722	7.0	126,699	7.7	807	14.7
South Carolina	78,740	5.6	98,600	6.0	850	12.0
Georgia	70,981	5.0	104,538	6.4	917	10.3
Pennsylvania.....	47,978	3.4	39,854	2.4	965	6.4
Wisconsin	43,272	3.1	52,890	3.2	1,230	10.0
Ohio	38,605	2.7	45,695	2.8	950	11.1
Connecticut.....	31,501	2.2	32,409	2.0	1,385	37.1
Massachusetts	10,312	0.7	11,728	0.7	1,413	29.7
New York	1,228	0.1	855	0.05	950	12.0
Minnesota	1,958†	0.1	2,875	0.2	1,250	10.5
United States	1,405,563	...	1,635,210	...	778	12.9

* From U. S. Yearbooks.

† Average of 1928-30, inclusive.

TOBACCO PRODUCTION IN THE UNITED STATES

A condensed summary of the average production in several states, the average yield per acre in pounds, and the average price per pound is of interest. Figures regarding prices are for 1928 and, while relative, are not applicable now. There is every reason to believe that as satis-

factory a cigar-binder crop can be grown in Minnesota as is now grown in Wisconsin. The present period of low prices for farm crops is not a favorable one, however, for the undertaking of a new industry.

TOBACCO REQUIRES FERTILE SOIL

Tobacco will grow in any soil, from heavy clay to light sand, if there are enough available nutrients. The quality of cured leaf is greatly influenced by the soil upon which the plant is grown. For example, the filler type of tobacco known as Zimmer Spanish, grown in Ohio; the cigar-wrapper type grown outdoors in the Connecticut Valley; and the cigar-binder tobacco grown in Wisconsin and Minnesota are practically the same variety.

The amount of plant food elements removed by a normal tobacco crop of 1,200 pounds of cured leaves per acre is compared with that of other crops in Table 2.

Table 2
Plant Food Elements Removed Annually by Crops*

Crop	Estimated yield per acre		Pounds of plant food elements removed per acre			
	Grain	Straw	Nitrogen	Phosphorus	Potassium	Calcium
Corn	35 bu.	1.05 t. stover	51.8	8.1	24.9	7.7
Wheat	25 bu.	1 t. straw	45.5	8.0	17.0	5.0
Oats	45 bu.	1.25 t. straw	37.0	9.5	34.0	7.5
Barley	30 bu.	.....	42.0	7.0	31.5	6.0
Alfalfa hay	3 t.	.....	140.0	14.0	50.0	67.0
Clover hay	1.5 t.	.....	60.0	7.5	45.0	33.7
Potatoes	100 bu.	.....	22.0	4.5	30.0	2.0
Tobacco	1,200 lb. leaves and stalks	.....	70.8	4.1	77.6	54.8

* From Hughes and Henson, Crop Production. McMillan Company. 1930. Tobacco data from Lucius L. Van Slyke, Fertilizers and Crops. Orange Judd Company. 1920.

Tobacco uses more nitrogen than most other farm crops and a much larger amount of potash and calcium than corn, wheat, oats, or barley. For this reason it is necessary to fertilize heavily if good yields are to be obtained.

COST OF PRODUCTION

Recent data are not available regarding the cost of producing tobacco in Minnesota. Records taken by several farmers were given in Bulletin 150, published in 1915 and now out of print. The estimates given here are based on the figures given in Bulletin 150 and the experience of the writers. They are sufficiently accurate to give an idea of the relative distribution of labor in various seasons of the year.

Table 3
Estimated Number of Horse and Man Hours Required for Various Phases of Tobacco Growing

Operation	Total hours of labor	
	Horse	Man
Seedbed management.....	5	18
Preparing the land	38	16
Transplanting	11	15
Cultivating.....	15	20
Topping, suckering .....	..	25
Harvesting	20	50
Stripping, bundling .....	..	40
Total	89	184

Calculating man labor at 20 cents an hour and horse labor at 8 cents gives a total cost of man labor of \$36.80 and of horse labor of \$7.12, a total of \$43.92. With land estimated at \$60 per acre, equipment at \$125, and 6 per cent for interest on the investment, the cost would be \$11.10. It is estimated, also, that there is an annual cost of \$12 per acre for the upkeep of the curing shed. This gives a total cost per acre of \$67.02. This does not include the value of the farm manure used.

The average yield of cured leaves per acre in Minnesota, given in Table 1, was 1,250 pounds. To give a return equal to the cost of production and without including the value of the manure, it would be necessary to sell the crop at approximately 5.4 cents per pound, at the present basis of low wages.

DISTRIBUTION OF LABOR

Approximate dates of the various operations are of interest, as they give an idea of the adjustment necessary to fit the tobacco enterprise into the system of farm management used on the particular farm.

Table 4
Approximate Dates of Various Phases of Tobacco Growing

Special phase	Period of work
Seedbed	April 1 to June 15
Land preparation (fall).....	September to October
Land preparation (spring).....	May 15 to June 15
Transplanting	June 5 to July 5
Cultivating	June 10 to August 1
Topping	July 20 to August 10
Suckering	August 20 to September 15
Harvesting	September 1 to September 15
Stripping	December 1 until ready for market

SEEDBED MANAGEMENT

In older tobacco regions the seedbed is steamed to kill weed seeds and diseases. A portable steam boiler that will maintain a pressure of from 75 to 100 pounds may be connected to a galvanized iron pan approximately 6 feet wide by 10 feet long and 6 inches deep. This pan is fitted with a hose connection and each area of the bed is steamed for 20 to 40 minutes. Similar results can be obtained by burning brush on the seedbed and then removing all debris.

One method of sowing seed that has been sprouted in a sack is to place them in a sprinkling can of 10 or 12 quarts of water, using about one level tablespoonful of sprouted seed for each can of water. A can of water and seed is then used for each side of a section of the bed $5\frac{1}{2}$ feet wide and 14 feet long, being careful to stir the seed in the water before sprinkling the mixture on the bed. If the seeds do not pass through the sprinkler readily the holes can be opened to the size of a shingle nail.

If seeds are sown by mixing them with sawdust or wood ashes, the rate given above can be followed. Mixing wood ashes with seed makes it easy to sow them uniformly.

Preparation of bed.—Well rotted manure can be applied in the fall and plowed or spaded under and 5 to 10 pounds of a complete commercial fertilizer for each 100 square feet of seedbed can be worked in before sowing the seed.

The seedbed should be where the soil is rich and somewhat protected from north and west winds. Before sowing the seed the bed should be raked thoroly to a smooth level surface and firmed by tramping.

Seedbed frames are usually $5\frac{1}{2}$ feet wide and can be made of boards one inch thick and 6 or 8 inches wide. Across the corners and at about 6-foot intervals 1×4 -inch strips of board are nailed to give added strength.

Seedbed covers are made of muslin or of hotbed sash. The muslin is stretched over the bed and in some cases held up in the center by a galvanized wire, running lengthwise of the bed, two or three inches above the level of the frame. A method used frequently in Minnesota is illustrated in Figure 1.

Sowing the seed.—Several methods can be used for sowing the seed. As a rule they are sprouted indoors. A method used frequently in Minnesota consists of placing the seeds in a muslin sack and soaking them in water for 24 hours, then placing the sack in a box of sawdust in a temperature of about 80 degrees Fahrenheit. The seed can be sown when they crack, after five or six days. Another plan is to mix the seed with finely rotted wood or sawdust and put the mixture

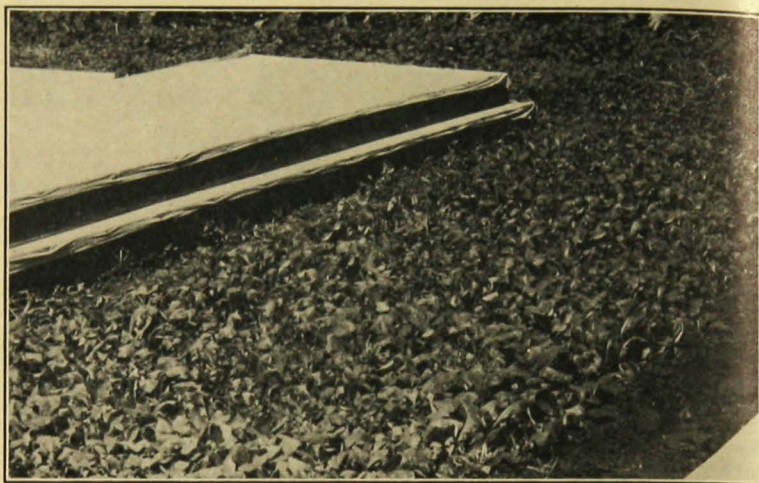


Fig. 1. Frame and Cover Used for Tobacco Beds

These are 5½ feet wide and 14 feet long and can be lifted from the bed for watering, weeding, and pulling the plants.

in a jar. It may be kept moist at room temperature and stirred occasionally. As soon as the seeds crack (show white) they can be sown.

A heaping teaspoonful of seed is sufficient for 25 square yards of seedbed. An ounce of seed (a heaping tablespoonful) contains approximately 300,000 seeds.

Watering.—When the seedlings are small and during dry weather they should be watered daily. Later they should be kept from severely drying out but need to be watered thoroly instead of frequently. A solution of two or three pounds of nitrate of soda in a barrel of water used in thoroly wetting the bed may be advisable if the plants are growing slowly or show a tendency to become yellow.

Weeding.—If the seedbed has not been sterilized, weeds must be removed by hand.

Hardening off.—The plants should be hardened off by removing the cover several days before they are transplanted to the field.

Pulling plants.—When the plants are 4 to 6 inches in height in the seedbed they are ready for transplanting. The bed can be watered thoroly and the plants pulled and placed in boxes in an upright position. The plants can be pulled by grasping the leaves. Several pullings can be made at intervals from the same bed.

GROWING THE CROP

The soil.—Sandy or sandy loam soils rich in available nutrients, nitrogen, phosphoric acid, potash, and lime give the best quality of cured leaves.

In Wisconsin and the Connecticut River Valley, tobacco is grown continuously on the same soil for many years.

Liberal applications of composted barnyard manure are used by the successful tobacco grower. Complete fertilizers containing nitrogen, phosphoric acid, and potash in the proportions of 2-12-6 may be applied and as much as 1,500 to 2,000 pounds per acre on new land not manured. Two hundred to 600 pounds per acre may be used with a coating of manure. Fall plowing, spring disking and harrowing, and the use of a planker or roller just before transplanting are desirable methods of preparing the land. If only light applications of commercial fertilizer are used, it should be sown with a fertilizer attachment when transplanting the plants.



Fig. 2. A Tobacco Setter in Operation

Setting the plants.—Distances between the rows range from 32 to 38 inches with the plants from 18 to 24 inches apart in the row. Well fertilized soil will grow plants satisfactorily if set 18 inches apart. The most common method is to use a transplanting machine, which requires a driver and two persons to drop or set the plants. A tobacco setter in operation is shown in Figure 2. The machine carries water and about a pint is placed at the roots of each plant. The plants may be set by hand if only a few are grown. This can be accomplished best by setting the plants in the afternoon and, preferably, on a cloudy day. Some recommend the use of a dibble, a piece of wood 6 by 8 inches used to make the holes for the roots. The method is as follows: In placing the plants in the soil by hand, first make a hole the proper depth with the dibble just as in transplanting cabbage. Hold the tobacco plant loosely in the fingers, the root end projecting beyond the finger tips just a little farther than the depth to which it is to be set. Put the roots in the hole to the proper depth and push the dibble down beside the hole, the point slanting toward the roots of the plant; then by drawing the hand over, crowd the dirt up against the roots and stem of the plant. Give each plant about a pint of water after it is set.

Cultivating.—Clean cultivation is necessary. This aids in eliminating weeds and conserving moisture. Some hoeing is usually necessary. If cultivated frequently the weeds do not start and shallow cultivation is all that is needed. Care must be taken not to cover the growing point of the plant at any time, either when setting the plant or during cultivation.

Resetting.—Some of the plants are sure to be destroyed by cutworms or wireworms, or from natural causes. These should be replaced in order to obtain a good stand in the field.

Topping.—Buds or flower heads may be removed by pinching them off as soon as they appear. Later, when nearly all plants have budded, the field can be topped by breaking off the top with the thumb and forefinger uniformly at about the same height. Later maturing plants should be topped lower so that all plants will mature at about the same time. Topping just below the bald sucker, the lowest sucker without leaves, is a satisfactory general plan. Two or three weeks, or thereabouts, after topping the crop is ready to harvest. At this time the plants take on a slightly yellow tinge in spots and the upper leaves become thick and mottled in appearance.

Suckering.—Suckers appear in the leaf axils after the tops of the plants have been removed. These should be removed in order that all food reserves may go to the leaves. The suckers can be broken off by hand after they are a few inches long.

Insects.—Cutworms, wireworms, and grubs may damage the

young plants. If the growing point is cut off the plant should be replaced. If cutworms are very prevalent, a mixture of bran, molasses, and paris green may be scattered along the rows. The following mixture is satisfactory: 20 pounds of bran, 1 pound of paris green, 2 pints of molasses, $3\frac{3}{4}$ gallons of water. Cut worms may be removed by hand from near the growing seedling, and killed.

Grasshoppers may be partially controlled by growing several rows of corn around the field and by scattering poisoned bran mash.

Diseases.—Diseases probably will not be very serious the first few years that tobacco is grown. It is not feasible to discuss them. They consist of damping-off in the seedbed, root rots, wilt, mosaic, and wild fire, altho as yet these diseases have not been especially injurious in Minnesota. Wisconsin, Havana 142, is resistant to black root rot.

The following equipment is necessary:

Tobacco ax.—A small hand ax is desirable to cut the plants off close to the ground.

Tobacco needle or spear.—A sharp-pointed spear that fits over the end of the lath (see page 1).

Lath.—The average dimensions are $\frac{1}{2} \times 2 \times 48$ inches. This is a special lath and 800 to 1,500 are required for each acre.

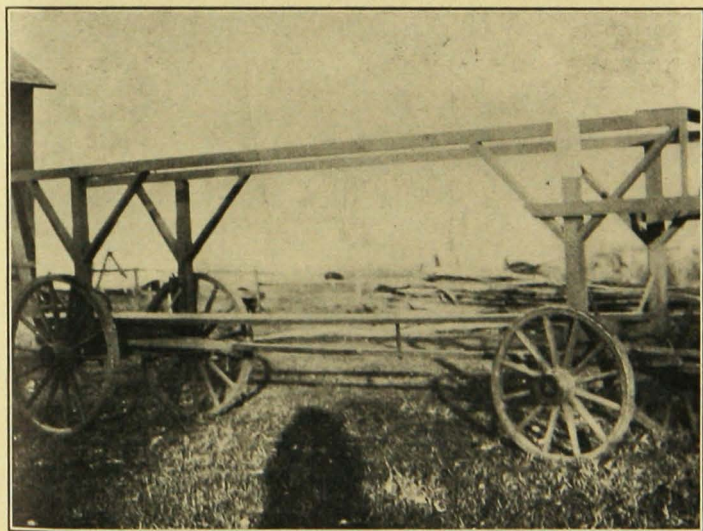


Fig. 3. Tobacco Rack

Used to carry strung plants from the field to the curing shed.

Tobacco rack.—This consists of a frame for the wagon which allows the strung lath containing the plants to be hung upright while transporting the crop from the field to the curing shed. The upper part of the rack, hung 4 feet above the wagon bed, may consist of parallel

2×6-inch boards and braces made into a rack, which may be placed upon the wagon frame. A good type of harvesting rack is illustrated in Figure 3.

Wooden horse.—A two-legged wooden horse made of 2×4 lumber, 10 feet long, with 3-foot legs nailed about a foot from one end and fitted with a socket about 6 inches deep, is used to hold the lath while the plants are strung on it.

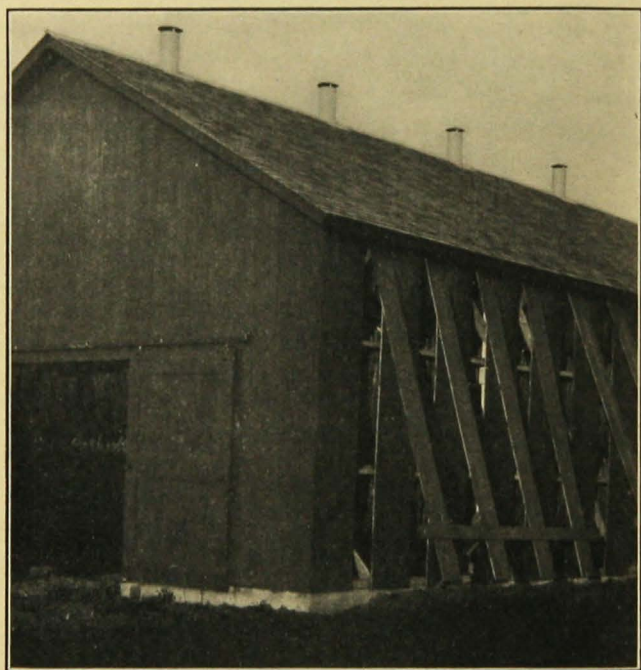


Fig. 4. Tobacco Curing Shed

Tobacco curing shed.—The curing shed can be used to advantage by the more experienced operator who wishes to increase his tobacco work. The shed is fitted with poles upon which the laths are hung; also with side ventilators, which may be opened and closed when necessary. The strung laths are hung about 6 inches apart on these poles and there should be an air space between successive tiers in the shed. In periods of prolonged hot dry weather it is desirable to close the ventilators of the shed during the hottest part of the day and open them at night. In windy weather the doors on the side of the shed from which the wind blows should be closed in order that the plants may not be broken. In long periods of wet weather it may be advantageous to close the ventilators, and under no circumstances should rain fall directly on the curing leaves. A tobacco shed with the end door open and ven-

tilators on the side is shown in Figure 4. For the beginner who may wish to grow only a small amount of tobacco it is often possible to cure the crop in the upper part of the stock barn.

HARVESTING THE PLANTS

The tobacco plants are cut off close to the ground, allowed to wilt in order to reduce damage from breakage and then strung on laths. Six large plants are sufficient for a lath; more can be strung on one lath if the plants are smaller. Care must be given not to allow the plants to be injured by sunburn after they are cut and before being hung in the shed. A field ready for harvest is shown in Figure 5.



Fig. 5. Field of Tobacco Ready for Harvest

BUNDLING THE CROP

About December 1 the crop is ready to be taken down. The leaves are stripped from the stalk and bundled. The crop can be taken down only during wet, foggy weather when the leaves can be handled without breaking. In this condition the crop is said to be in "case" and before stripping it is placed in piles to prevent drying. The piles can be protected by covering them with blankets or cornstalks. It may be desirable to grade the crop at the time of stripping. This is generally done by placing the end of a lath in a convenient holder and stripping the stalk with both hands. The lower two to four leaves on the plant, of lower grade, are stripped and bundled together. Damaged or broken leaves are included in this grade. If the crop is injured severely by wind or hail, all can be placed in one grade and sold as stemming.

A box used for making the bundles may be from 32 to 36 inches long, 12 inches high and wide, and with ends 6 to 8 inches higher than the sides. Detachable sides should be used to supplement the height

of the box in order to fill it. A plank or board to fit the inside is used to press down the leaves. Lay three strings (tobacco twine) in grooves on the sides of the box and cover the inside of the box with a sheet of tobacco paper. Pack about 40 pounds in each bundle with the ends of the leaves to the outside, and tie the bundle with the twine. These bundles should be placed on some sort of platform so they are not in contact with the ground and only about two bundles deep and protected from strong currents of air. The crop is generally sold in the bundle to the warehouseman, or the Tobacco Pool may handle the sale of the crop.

FERMENTATION OF TOBACCO ON THE FARM

The natural sweat method of home fermentation is advised by W. W. Garner (see Farmers' Bulletin 1580, United States Department of Agriculture). This can be accomplished by packing the leaves very tightly in wooden boxes about 30 inches square and placing from 300 to 400 pounds in a box. These boxes, or cases, are fairly tight on the sides but have half-inch spaces between the end boards. Thus if five end boards are used each would be nearly six inches wide. The sides of the boxes are covered with heavy paper and the leaves packed in overlapping rows with the butts toward the ends of the box. Removable sides must be used to facilitate packing the leaves tightly into the box. When pressed down there should be a space of an inch and a half between the butts of the leaves and the ends of the box. The tobacco is pressed in by means of levers or some other similar device and the cover is nailed on. If this is done in the late winter or spring the crop will commonly have completed fermentation by the following fall. The temperature in the fermenting leaf may vary from 95 to over 130 degrees Fahrenheit.

Before packing the leaves in the box it is desirable to have them moist so they can be handled without breaking. If the leaves are too dry they can be sprayed with water and packed in a pile in a warm room. After a few hours they gradually assume a uniform moisture content and can then be packed in the box.

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